# Applications Using integrated Modeling Techniques

**Laura Needels and Dave Redding**
Jet Propulsion laboratory, California Institute of Technology
4800 Oak Grove Drive, M/S 198-326
Pasadena, CA 91109
(818)-354-4379 FAX: (818) 393-4440

Wc wish to submit this abstract to the
17th Annual AAS Guidance and Control Con ference
Keystone, CO.
(Storyboard Presentation)

Many current and future projects have such stringent accuracy requirements that it is widely becoming recognized that a multi-disciplinary approach must be taken when designing the project. The need for large aperture and/or long baseline size leads to large structures and active controls, Structures deform from combinations of stresses duc to gravitational and thermal loads, and internal mechanical forces such as on board instrumentation and guidance devices. The design and tolerance of these projects must be capable of predicting resultant optical quality under these conditions. Such projects include space and ground based telescopes, interferometers, adaptive optics systems, laser communications and weapons, and many other instruments, such as star trackers, fine guidance sensors, guidance and control equipment.

J]'l. has been developing a software tool, lMOS (Integrated Modeling of Advanced Optical Systems) which allows spacecraft to be deveoped using a multidisciplinary approach by integrating the structural, control and optical Subsystems of these spacecraft. The engineering disciplines supported include structural (including thermal), controls, and optics (JPL's COMP - Controlled Optics Modeling Package), Excellent graphics/plot ting capabilities exist in the tool. Also available arc all of the control design, analysis, and simulation functions and tool boxes contained in MATLAB. The software package is available through COSMIC.

The tool has been used for preliminary design studies, as well as for more detailed studies, such as the in-flight optical testing for the 11S'1' and Mars Observer Camera, adaptive optics system design, tc]c.scope slew and settle simulations, analysis of control system fine guidance sensors, segmented mirror figure control system design, binary star resolution, thermal distortion on the SMIM spacecraft, and optimal passive damper placement using a variety of optical and structural performance metrics, point spread functions used for image deconvolution restoration of HST, and analysis of controlled resonant cavities for a gravity wave observatory.

The storyboard will include highlights from many of the recently solved multidisciplinary problems solve.d using the modeling tool as well as a detailed description of the capabilities currently available. Wc will also present long term direction of the project, including incorporation of ncw computation technologies and expansion of discipline area.